



**THE COPPERBELT UNIVERSITY**

**SCHOOL OF MATHEMATICS AND NATURAL SCIENCES**

CS421 TEST                      19<sup>TH</sup> JULY, 2022      TIME: 1 hr 20 Mins

Q 1. Assuming we want to calculate  $F_i = \text{Cos}(\text{sine}^{\text{sqr}(x_i)})$  for  $x_1, x_2, x_3 \dots \dots x_8$ , using 3 processors. And assuming the time for each step is one unit. **[8 marks]**

- i) Find Speedup and Efficiency for the pipeline version
- ii) Find Speedup and Efficiency for the partitioned version

Q 2. State six (6) characteristics that the data parallel programming model demonstrates. **[6 marks]**

Q 3. Define a One Instruction Many Data (MIMD) machine and hence or otherwise use an appropriate example other than the one used in class to illustrate your definition. **[6 marks]**

Q 4. Define the following Parallel Computing Terminologies. **[6 marks]**

- i) High Performance Computing    ii) Task            iii) Massively Parallel
- iv) Pipelining            iv) Symmetric Multi-Processor            vi) Embarrassingly Parallel

q 5. When designing a parallel program, the factors listed below need to be considered. Briefly discuss these factors. **[6 marks]**

- i) Load balancing                      ii) Granularity            iii) Synchronization

Q 6. Define speedup according to Amdahl's law and hence or otherwise calculate speedup given the following information and comment on the limits to the scalability of parallelism.

**[8 marks]**

Number of Processors	Serial fraction		
	0.135	0.025	0.015
50			
70			
100			
200			